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CHILDREN with IMPAIRED HEARING

an audiologic perspective

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CHILDREN with IMPAIRED HEARING

an audiologic perspective

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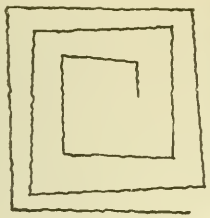

CHILDREN with IMPAIRED HEARING

an audiologic perspective

THERE is nothing new about the fact that a great many children have impaired hearing, nor about the conviction that much more can and should be done about this situation than has as yet been accomplished. Unlike most other disabilities, a handicapping amount of hearing impairment does not show, the way a distorted limb or a missing finger or blinded eyes "show"; the child with impaired hearing "limps" only socially, "fumbles" only psychologically, "stumbles" only vocationally. The child with a hearing impairment is frequently regarded as slow, inattentive, vague; he may be overaggressive or underassertive, and is commonly found in the ranks of the problem children, at home and in school. The core of hearing disability lies deep in human behavior. The function that we call ***hearing*** involves much more than the comprehension of sound; it is very much a part of the dynamics of behavior. The most serious effect of hearing impairment is that it produces a ***communicative disorder,*** an interference with the back-and-forth-ness between minds that is the essence of being human. These things are well known.

Not so well known, perhaps, is that a great deal can be done to reverse, to alleviate, or to compensate for a handicapping hearing impairment. Much has happened in the past 10 or 15 years to motivate changes in an approach to the problems of children with impaired hearing. There have been far-reaching advancements in electronics, specifically in the production of vacuum-tube hearing aids and in the design and development of precision instruments for auditory diagnosis and training. Moreover, the use of antibiotics and of radium therapy in medicine have radically altered the nature and extent of handling many problems, and new surgical techniques have been brought to bear on certain types of impairment. Wartime experience in the special handling of casualties with impaired hearing has taught valuable lessons in the ideas and techniques of rehabilitative management. All these developments have stimulated efforts in case-finding and in diagnosis, as well as research in both basic and applied problems of hearing and hearing impairment.

The result has been the emergence of a new branch of science called ***audiology***. Audiology is a highly derivative, eclectic field of knowledge. It represents a synthesis of several fields—among them, otology, physics, psychology, linguistics, biophysics, psychoacoustics, and pedagogy—undertaken for a specific purpose: to study and to treat the problems that relate directly to hearing and hearing disorders. The bibliography of research and clinical findings on these problems has multiplied a hundredfold in the past decade. With this surge of interest there has come a new perspective, focussed on both philosophy and methodology, and with the emphasis on prevention. This perspective involves a combination of medical and nonmedical methods and techniques and attitudes wherein the problems of impaired hearing are not the work of a narrow field of specialization, but of the special interests of seven or eight fields of knowledge which find a common ground in appraising and meeting the needs of the person with impaired hearing. This is the audiologic perspective.

ORIENTATION

These objectives are not new. Yet, we are only beginning to learn how to prevent a serious handicap in many instances, how better to understand some of the behavioral maladjustments and meet some of the educative, vocational, and social needs of the handicapped child. The concept of prevention is an important twentieth century idea. The subcommittee on medical care of the American Public Health Association expresses this philosophy of prevention:[1]

> **The unfortunate separation of preventive and curative medicine . . . is incompatible with the highest standards of modern medicine. Prevention no longer deals only with preventing the initial onset or occurrence of disease. It also means preventing the continuance or progress of disease which has already occurred; it means preventing the development or persistency of disability . . . and of dependency, destitution and other undesirable social effects.**

This might well have been written about the audiologic approach to problems of hearing impairment in children.

A healthy, audiologic perspective implies teamwork, and this involves concerted thought and action, not only about diseases of the ear, nor about disability of the hearing mechanism, but also about the relations

[1] American Public Health Association, Subcommittee on Medical Care: The quality of medical care in a national health program. ***American Journal of Public Health***, 1949, 39, p. 7.

between hearing and behavior that characterize the child. A useful pattern with which to think about these things may be laid out in seven steps: **(1)** public education; **(2)** adequate case-finding; **(3)** adequate diagnostic examination; **(4)** medical and surgical treatment as indicated; **(5)** audiologic consultation and treatment; **(6)** special education according to the needs of the child; **(7)** special vocational rehabilitation and guidance.

The present discussion is an attempt to enlarge and interpret various aspects of this pattern of thinking.

INCIDENCE OF HEARING IMPAIRMENT

Because of variations in the definition of impaired hearing and in test techniques employed, the incidence of hearing impairment among children is difficult to determine precisely. When pure-tone audiometry is used for case-finding and reasonably high standards are maintained, the incidence among school children can be generalized as 5 percent. If subclinical cases and those involving transient acute symptoms are included, the figure is in excess of 10 percent. No adequate means exist for determining the incidence among preschool children, but there is good reason to believe that it is about the same as in the older group.

An estimate based on available data and clinical experience is that of every 10 children found to have impaired hearing (by commonly accepted standards), 1 to 3 are at least minimally handicapped and require some form of special handling or special education, and 7 to 8 are remediable to adequate medical care or will remain at a level of impairment that is marginal or less than handicapping.

A conservative estimate places about 1 percent of children in the handicapped group. These are children with a hearing loss of 25 decibels or more in the better ear through the speech-hearing range. All require some special handling and training in speech (lip) reading; and some considerable proportion should use hearing aids (a rough indication of this need is an irreversible hearing loss in excess of 35 decibels below normal in the better ear) and should have auditory training. These estimates have no relation to other types of handicaps—such as cerebral palsy—many of which involve impaired hearing. If these are considered, according to a recent survey, some 2.4 percent of children have a handicapping amount of hearing impairment. Moreover, these estimates are based on the assumption that the majority of these children are found and treated adequately. That this is not presently accomplished lies beyond question. The most sanguine report as yet published indicates that no more than one-third of the school population is tested for

impaired hearing at any time, and there is not even this limited coverage among preschool children.

Otologic experience demonstrates that a significant proportion of the impairment that is marginal in childhood, or has its onset in childhood, is apt to become progressively greater in youth and adulthood. Among the total population, there is an estimated incidence of hearing impairment of about 10 percent. Much of this involves old-age hearing loss or otic pathology that is associated with other diseases, but there can be no question about the fact that a great deal of the trouble begins in childhood. This being so, it is reasonable to bring the best audiologic techniques of case-finding and case-handling to bear upon these problems as early and as consistently as possible, with the clear objective of prevention. Translated into man-hours lost from work, or into common observations of psychosocial maladjustments, the extent of hearing impairment is an important factor of public health and welfare.

HEARING, SPEECH, AND LANGUAGE

Hearing is one of man's primary means of relating himself to his environment. At least three levels can be discerned in this relationship. At the most primitive, perhaps subconscious, level, a person is aware of sound around him; this awareness links him closely with the world of movement and change, and without this link that world is materially changed. Somewhat more refined behavior is associated with sounds as signals or warnings or directions. Certain noises and sounds characterize certain conditions or events, and we learn to respond accordingly to the horn, the clock, the doorbell, the dripping faucet, and the like. Presumably the most refined level of hearing is directly related to man's use of language symbols.

Perhaps man's most distinctive characteristic is his ability to use symbols to communicate with his fellows. Indeed, a good argument can be made that the child's developing use of language symbols constitutes in large part what is commonly considered the growth of "mind," and that our measures and comprehension of intelligence are determined, or at least controlled in large part, by the development of language habits. Speech and hearing are the two basic elements of communication and of language; together with their derivative forms of reading and writing, they provide the foundations for much of human behavior. Communication is not a simple process, however. The learning, the perceiving, and the production of language involves a complex relationship among auditory, visual, and muscular stimuli and responses, and between

peripheral and central nervous systems. Inasmuch as language is chiefly learned through the hearing mechanism by imitation, the child learns to speak not only ***because*** but ***as*** he hears.

Communication begins very early in infancy, as the baby reacts to the requirements for food and creature comfort. Soon, he begins to babble, a stage of development which is probably a pleasurable combination of muscular and auditory stimulation and response. Toward the end of the first year and through the second year, the baby experiments freely with sounds, and some combinations begin to reflect the rhythm, form, and structure of speech that he hears. This is the onset of language. In the third year, the child usually becomes sharply aware of himself as a being different from others, and takes enormous strides in relating this self to the world. His use of language takes a great spurt and moves on at an increasing rate until, by the age of 8 or 9, the basic language pattern is fairly well established, and is an important aspect of behavior and adjustment.

For better or worse, the direction of this development is intimately related to most other forms of the child's behavior. This is the reason why we tend to judge much of childhood behavior and development in terms of language. In a way, it may be said that the eyes and the ears are the antennae of the "mind," and when the period of onset of speech and the development of language habits are seriously deviant, it is reasonable to check vision and hearing.

Moreover, there is clear evidence that impaired hearing at any age may interfere vitally not only with the direct relationships of communication by language, but also with other, more subtle but nonetheless important aspects of communication. Many of our adjustments are intimately concerned with an acoustic environment. The automobile horn, the clock, the door bell, the roar of traffic, the quiet of the meadow, the clatter of typewriters—to suggest a few—furnish us a host of signs and signals and conditions to which we respond during every waking hour. There is good evidence that the very existence of sound contributes to the "tone" of the individual's relationship to his environment. Regarding this relationship between sound and human behavior, it has been stated that ". . . the most efficient and indispensable mechanism for 'coupling' the constant activity of the human organism to nature's activity is the primary function of hearing."

That all three of these "levels of hearing"—the primitive, the significative, and the symbolic—contribute to normal behavior and development in infancy and childhood, as well as in adolescence and adulthood, is an aspect of health and welfare that is not as yet generally appreciated. Unfortunately, perhaps, our habits of communication are so universal that they are apt to be taken for granted; and the relations among hearing and understanding and behavior are so diverse that, for the most part,

they have not as yet been adequately defined and described in reasonably objective terms. These things need a great deal more study.

A fundamental idea upon which to build an understanding of the problems of impaired hearing is that its effect is always more extensive than the dysfunction of the hearing mechanism itself. However hearing may be defined functionally, it is never an end in itself, nor solely an activity of the end-organ. Biologically, it is a means of contact between the individual and his environment; behaviorally, it is the pathway to much that we understand as normal development; socially, it constitutes, with speech, the communicative link with our fellows at all levels of activity. The actual perception of sound, as a function of the hearing mechanism, is only part of the picture; in terms of behavior and communication, the basic disorder associated with a permanent hearing handicap is not the lack of hearing, but the lack of ready means of contact with the physical world, and the lack of back-and-forthness between minds. That is why, once the mechanism of the ear is put in as good repair as medical science can achieve, and there still remains a hearing disability, attention must be centered on the psychologic, social and educative aspects of communication with impaired hearing. Impaired hearing can never be divorced from the dynamics of behavior.

THE IMPAIRED MECHANISM

There are three classical types of hearing impairment—conductive, perceptive (or nerve-type) and mixed.

Conductive impairment is a condition that results from changes in the external canal or the middle ear, such as to interfere with the passage of sound into the inner ear. These changes have many causes, among which are upper respiratory infections of various types and allergic conditions. When often repeated or continued, these conditions can cause permanent changes and damage to the acoustic tube and the middle ear; on the other hand, these conditions are most amenable to treatment when they are discovered early. Conductive impairment typically involves a diminution of the loudness with which sounds are conveyed to the inner ear; it can never, by itself, cause total hearing loss.

Perceptive or nerve-type impairment involves the inner ear or the fibers of the auditory nerve system. This, too, has many causes, important among which are toxemia and virus infection. In genetic terms, there are various anomalies which are typified by atrophy or lack of development of auditory nerve fibers, so that the hearing mechanism is incomplete. Within recent years it has been determined that rubella, or German

measles, during the first few months of pregnancy may be particularly destructive of the hearing nerve. Nerve-type impairment is usually characterized by the fact that the high tones are more affected than the low tones. A nerve-type impairment always involves auditory distortion, and of course it may involve a reduction in loudness, as well.

A conductive-type impairment may frequently occur together with a nerve-type impairment, the one being amenable to treatment, the other not. When this happens, a tonsillectomy or adenoidectomy, or radium therapy, or allergic treatment, may be indicated to improve the level and nature of the impairment without correcting the entire problem. This is a common state of affairs and needs to be understood: the point is that the impairment should be reduced as far as possible by indicated treatment.

Many of the problems of impaired hearing in children have to do not only with hearing, but with understanding. The amount of hearing loss which might be negligible in an adult may be a tremendous deterrent for the child. Moreover, not only the amount but the type of impairment is important. Hearing impairment is not a single, clear-cut entity; it has a wide variety of forms and extents, with equal variation of effect and amenability to treatment. When the trouble is reversible, or may be materially lessened, as is often true, it is important that this be done as early as possible. Fortunately, much of this work can be undertaken with minimal medical care, and with relatively little expense in time and money.

HEARING FOR SPEECH

At best, the perceiving and understanding of verbal language is a complex process. The sounds of ordinary speech are by no means simple physical occurrences; they are complicated acoustic events, the simplest of which is composed of a combination of fundamental tones and overtones involving rapid changes in energy and resonance that present constantly changing auditory stimuli.

As a selective amplifier, the normal hearing mechanism is a remarkable instrument, capable of sorting and transmitting complex sounds to the brain with a fidelity as yet unachievable by the best of electronic engineering. Because of developmental anomalies or disease, however, this mechanism may be thrown out of kilter in many ways. Ordinary speech sounds have a tonal range from approximately 250 to 4000 cycles per second; that is to say, the ready understanding of speech sounds calls for reasonably balanced audition within this frequency range. When the hearing mechanism is affected, transmission and perception of speech

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sounds is affected too, in terms of diminished loudness or increased distortion or both. The child with a nerve-type impairment, for instance, may hear the lower part of the speech-range fairly well, without being able to hear the middle and upper parts well enough to distinguish many common sounds of speech.

In general, our ability to discriminate most vowel sounds is governed by auditory acuity up to 1500 cycles per second in frequency, while the most important range for discriminating consonants lies between 1000 and 4000 cycles. Any serious impairment in this mid-high range makes it difficult or impossible to distinguish many consonants. This is a common enough impairment among both children and adults; in the young child who is learning speech and language, it often constitutes a serious handicap. The child hears some but not enough; speech is apt to be retarded and garbled when it does develop—for the child speaks as he hears—and the world of communication is distorted and confusing.

A further complication exists in that ambient noise (or environmental sound) is an ever-shifting complex. The world is a noisy place. A slight summer breeze produces a sound-intensity of about 15 decibels; the ambient noise in a quiet house approximates 30 to 35 decibels. Very quiet conversation ranges between 45 and 50 decibels; loud conversation between 60 and 65. Traffic noises on a busy corner may be as intense as 70 to 75 decibels, a subway train 95, a passing airplane 100. Inasmuch as all speech is a continuum, a moving, flowing, ever-changing series of sounds, always set against a background of ambient noise, it is not surprising that the child with even a moderate amount of impairment has trouble, or that his attention wanders. Depending upon the nature and degree of impairment, such a situation makes it difficult, sometimes impossible, for the child to discern language well enough to learn how to reproduce it intelligibly. Indeed, in many instances, the fact of unintelligible speech may be direct evidence of a handicapping hearing loss.

DIAGNOSTIC TESTING

When impaired hearing is in question, the diagnostic process must involve at least two steps which are concurrent: (1) thorough otologic examination, including nasopharyngoscopy, and supported by a full battery of functional tests; (2) an analysis of the child's communicative behavior, according to the findings of the diagnostic tests. The second step involves consideration of general development, social maturity, speech, language perception and the like. Inasmuch as the child-as-a-whole should be appraised, in an adequate program of medical care,

good pediatric handling should underlie any special attention to hearing, vision, or general health and behavior.

Methods of testing the hearing of young children are receiving much attention nowadays. In the past, it has been customary to employ various devices—tuning forks, bells, clickers, whistles, snappers and what-not—and to watch for the pupillary reflex, the turning of the head or other gross responses deemed significant. These methods and devices are open to serious criticism in that they do not provide accurate information, and emphasis is now put on newer electronic techniques.

For about 15 years, the pure-tone audiometric test has been standard; more recently, speech audiometry has been standardized. Information gained from both kinds of tests is necessary and useful. Pure-tone audiometry is of great diagnostic value; it presents a pattern, called an audiogram, of the residual hearing across a range of six or seven octaves. The audiometric patterns of a wide variety of lesions are well-known, and from the study of these patterns—together with knowledge of other symptoms—much information may be obtained about the nature and extent of the hearing loss. In screening tests for case-finding, modifications of clinical tests are employed which can give similar but much less exact information.

Pure-tone audiometry with a child under the age of 5 years is commonly considered impossible. This is an arbitrary dictum to which there are many exceptions. Many 7- and 8-year-olds are quite intractable in the first few test situations; many 3- and 4-year-olds are teachable and responsive. Reasonably good audiometry is now being done with 3-year-old children, with the use of the principle of the conditioned reflex, and experiments are being made with methods applicable to 2-year-olds. Such testing is time consuming, however, and still requires the cooperation of the child, usually difficult to achieve and maintain. More recently, objective audiometry, requiring no active participation nor cooperation on the part of the child, has been under investigation. Accurate, pure-tone audiometric measurement of children as young as 7 months has proved possible, by the use of a galvanic skin-resistance response with a conditioned reflex, and this testing is now done routinely with 1- and 2-year-old children. The result of all this work is that a great deal of accurate diagnostic information is being obtained at an earlier age than was heretofore possible. Consequently, both medical diagnosis and non-medical audiologic appraisal can be achieved early, and steps initiated immediately toward the necessary medical treatment and the stimulation of communicative development by whatever means are indicated.

Meantime, the use of speech audiometry has been perfected, with precision instruments and standardized techniques. The idea of speech-audiometry is to measure how a person hears speech at threshold and at comfortable loudness. There are a good many limitations to the use of

speech-audiometry with children; much depends upon the age of the child and upon the amount of language he has. If the child has some auditory perception of language, it is possible to obtain a fairly accurate measurement of his hearing loss for speech.

The problem of diagnostic testing is complicated always in that one is never dealing with a black-and-white distinction between hearing and not hearing. Many children have auditory impairment that interferes seriously with language development, and greatly with behavioral adjustment, yet does not preclude their awareness of many environmental sounds, nor their ability to respond to calling or to the low-frequency clicks and claps that are often employed as the sole means to test hearing. ***Deafness,*** as the term is commonly used clinically and habitually used educationally, is by all means a relative term, involving dozens of variations of auditory function and of auditory potential. The pediatrician, the otologist and the audiologist, who are concerned with diagnosis and the forces of prevention, must think in causal terms with factual findings, with a view to treatment, rehabilitation and guidance. A communicative disorder caused by hearing impairment in a child is a highly individual matter, involving a complex psycho-physical system and all aspects of the personality. The appraisal and treatment of the disorder is a problem of medical care, not a function of education; that comes later, and has to do only with the children whose impairment cannot be reversed or kept with marginal limits.

CLINICAL AUDIOLOGY

For various reasons, a great deal of what has been done about impaired hearing in children has been centered in the school-age child: the school system presents a workable administrative organization for case-finding; the presence of hearing impairment at school age interferes with the child's education and obviously something must be done about it; the school system, among the large units of public agencies, is presently best able to finance such a fundamental matter of physical status. Yet the public school system covers only a part of the field. Aside from those school-age children not in the public school system, there is the whole group of preschool-age children, where the problems of prevention and mitigation are even more important. The child from 2 to 6 is at his peak as a language-learning, developing, behaving personality. Whatever interferes with the normalcy of activities in this age range takes its greatest toll in the development of the child. If the 3-year-old has a 50 decibel impairment, the time to do something about it is at the age of 3, not at the age

of 5 or 6 when the child enters school, after he has accumulated the deviant behavior of inadequate hearing, poor speech development, and social maladjustment that usually derives from a 50-decibel impairment. Moreover, with adequate otologic and audiologic clinical work, the 2-year-old whose hearing is severely impaired may by school age arrive at a much better functional status and accordingly be that much better off, further developed, and more readily educable. So, too, the 3-year-old, now often placed in a special institution, may after early treatment and adequate remedial measures be able to enter and hold his own in regular school. These are not vague hopes; these things are now being accomplished. And with the further improvements in audiologic knowledge and services that will surely be made, the range of accomplishment can be notably extended.

The clinical task is not to educate the child, but to diagnose, analyze, and treat the physical disability, and to institute remedial or rehabilitative steps to offset the communicative disorder as early as possible. This involves pediatric, otologic, audiologic, psychiatric, and psychologic services. There are as yet only a relatively few audiologic centers—part and parcel of medical centers—where this is being done to any great extent: New York, Boston, Syracuse, Pittsburgh, and Baltimore in the East; Cleveland, Chicago, and St. Louis in the Middle West; San Francisco and Los Angeles in the Far West. Various aspects of this work are being done in other places and there is promise that a very considerable expansion will occur within the next few years.

Perhaps equally important, in the audiologic perspective, is the institution of programs of case-finding of sufficient range to cover the needs of every community, and of adequate services for diagnosis and treatment. This is the core of preventive work, and commends itself at the public health level of thinking. Moreover, it is perhaps axiomatic that the treatment of a physical condition without due attention to the various psycho-social factors related to the individual's needs, cannot bring about the desired achievement of maximum health. Accordingly, for the children with irreversible hearing impairment, we refer not to the treatment of the ears, but to the treatment of the communicative disorder caused by hearing disability. Therefore, prevention consists not only of the reversal of clinical or subclinical symptoms of the ear, but also the mitigation of collateral symptoms related to adequate behavior and development.

There is no longer any need for the child to arrive at the age of 5 or 6 with a hearing impairment that is undiagnosed, unmeasured, untreated, and uncompensated for by early guidance and training. Once the diagnostic picture has been clarified, in both physical and developmental terms, and appropriate medical treatment carried out, it is the business of the audiologic center to guide and teach parents the needs of the child, to work out a program designed to stimulate language and behavioral

development, to study and carry through the child's needs in amplification (whether it be an individual hearing aid or a binaural, training amplifier) and in the training of residual auditory pathways; to introduce parents to the facts of speech (lip) reading as a concomitant or adjunct to the use of residual hearing; and to stimulate the development of normal conversational habits. This is done on an outpatient basis, and frequently involves multiple consultation and the use of whatever local facilities are available. The key to audiologic work with preschool children—the age of 18 to 24 months is the time to begin—is parental insight and understanding; it is necessary to work with parent and child toward whatever objectives are demonstrated by the child's needs. It is no rare thing nowadays for a child aged 4 with a severe hearing impairment to be well on the way toward a good vocabulary and a happy adjustment to the family and world around him. It should go almost without saying that this special clinical work should extend only so far as to demonstrate the facts and the nature and direction of the remedial steps that are necessary; from this point, the child may progress to regular school, with or without the need for special adjunctive education, or to a special school.

DEFINITION: DEAF AND HARD OF HEARING

The nature of acoustic distortion and its effect on the language development and related behavior of the child with impaired hearing are constantly under study. The more that is learned about these problems, the more inappropriate seems some of the terminology commonly applied to auditory impairment. For audiologic purposes, there is good reason to discard the terms ***deaf*** and ***hard of hearing,*** so that clinical attention may be centered on the physical symptoms, on the accurate measurement of auditory acuity, on possible measures for treatment, and on the relations between the impairment and developmental behavior.

Much of the implication is in the common use of the terms ***deaf*** and ***hard of hearing*** reflects classical attitudes of special education, of pre-electronic otology, and of a society that tends to think in black-and-white terms. In 1937 the Conference of Executives of American Schools for the Deaf agreed upon the following definitions:[2]

> **The deaf: those in whom the sense of hearing is nonfunctional for the ordinary purposes of life. This general group is made up of two distinct classes based entirely on the time of the loss of hearing; (a) the con-**

[2] *Josephine B. Timberlake: Terminology: "Deaf"—"Hard of Hearing."* ***Volta Review,*** *1942, 44, p. 140.*

genitally deaf—those who were born deaf; (b) the adventitiously deaf—those who were born with normal hearing, but in whom the sense of hearing is nonfunctional later through illness or accident.

The hard of hearing: those in whom the sense of hearing, although defective, is functional with or without a hearing aid.

Here the differentiation between the two groups is stated specifically in auditory capacity; the one group presumably does not have it, while the other group has. In view of current diagnostic findings and the amount of amplification available in modern hearing aids, this is questionable. The concept of deafness was developed long before the advent of the audiometer and the vacuum-tube hearing aid. In proportion to the number of children with impaired hearing, total hearing loss is not frequently encountered. Moreover, it has become evident that in many instances a sharp differentiation between the so-called deaf and the so-called hard-of-hearing child is not warranted. We are dealing with children, not ears, and individual differences in responsiveness, social maturity, and capacity of language learning may far outweigh the static categories of auditory capacity. Children are not static and the techniques for handling them must be as flexible as necessary to help the child realize his potentialities.

The special educator has traditionally made a necessary distinction between the child whose hearing loss has precluded the learning of speech and language, and the child who has some speech and language, however inadequate. Yet this cannot be a static categorization, as recent work with very young children has demonstrated. A great deal can be done to stimulate the development of speech and language with the profoundly impaired child, long before he reaches school age. Constant work with auditory stimulus in genuine communicative situations can help develop the use of minimal amounts of residual hearing to good effect, and such training at the nursery or prenursery level is salutary for both receptive and expressive functions of language.

Perhaps equally important is the fact that a great many children, now classified as hard of hearing, may have great difficulty with speech and language. These are usually problems of nerve-type impairment distinguished by relatively good hearing for very low tones but with a precipitous hearing loss for all other tones. This is a confused and confusing auditory condition; some of everything is heard, but not enough of anything related to language. Speech is typically retarded 2 or 3 years; oftentimes, the problem of hearing is not even recognized at first; instead, the child is thought to be dull, slow, and retarded mentally as well as socially. There is good reason to believe that there are many such cases, and that, as a group, they need much more help, audiologic and educative, than they are receiving now.

So far as definition of hearing loss is concerned, the point is that not only the extent of damage to the hearing mechanism, but the effect of

this on each particular child, are matters to be determined, studied and compensated for at as early an age, and by every means, possible. This is part of the task of clinical audiology.

SPECIAL EDUCATION

Although special education lies outside the scope of clinical audiology, it is very much a part of a program for children with impaired hearing; and in the aspects of development and behavior which relate to communication, what happens to the handicapped children in the educative process is very much a part of the audiologist's interests. For many reasons, the problems of the severely impaired child have in the past been delegated largely to the special educator. This situation no longer obtains. One important result of recent developments in audiology is that a wide range of professional interests are centering on ***all*** aspects of the problems of children with impaired hearing; a great deal of information is being accumulated which qualifies some of the traditional ideals and methods applicable to the training of these children. For better or worse the time is past when work with these problems is the special province of a particular group.

It has been suggested that the definitions commonly employed with regard to hearing impairment were derived long before present means of diagnosis, treatment, and training were developed. Stress has been laid in this discussion upon the importance of beginning work with the handicapped child as early as possible. This principle has been recognized by a few special educators, and has been put into practice in recent years in a few special schools. Without exception, when special work is begun at the age of 4 (at the age of 3 in a few day schools), these educators report faster progress, better development in language and in adaptive behavior, and a generally higher level of educability and social maturity. The schools where this is being done are usually those which have constantly put heavy stress on speech and voice training, on the use of amplification, and on the development of keen teaching techniques wherein language and behavior are closely related to the child's environment. The work of these schools pays excellent dividends in the level of communication, psycho-social adjustment, and vocational adaptiveness of their graduates. Unfortunately, schools for the deaf of this caliber are not the rule across the nation. As a matter of record, of the 20,252 pupils registered in schools for the deaf in 1949, only 1,795 were under the age of 6; in this group, of the 13,376 pupils registered in public resi-

dential schools for the deaf, only 660 were under the age of 6. This situation should improve materially in the next few years.

The "deaf" child

Educators of the deaf are by no means agreed among themselves about the philosophy and methodology that should underlie their efforts. This division of view sometimes approaches an abysmal difference, in practice if not in theory. Many educators believe firmly that deafness is a physical and behavioral absolute, involving fully circumscribed limits of linguistic behavior and behavioral and vocational accomplishment, and often involving a life of segregation and prescribed vocations for the deaf youth and adult.

This view is epitomized in a statement made only 5 years ago with regard to the needs of "deaf" children:

> **The aim of the education of the deaf child should be to make him a well integrated, happy deaf individual, and not a pale imitation of a hearing person. Let us aim to produce happy well-adjusted deaf *individuals,* each different from the other, each with his own personality. If a child cannot learn to read lips well or cannot speak well, far better develop other modes of expression and communication, writing and gesturing, than make him feel ashamed and frustrated because he cannot acquire the very difficult art of speech and lip reading. Our aim must be a well-balanced, happy *deaf* person and not an imitation of a hearing one.**

There are many supporters of this view, and attention must be paid to it. Its assumptions appear to be: **(1)** deafness is an absolute, not a relative state; **(2)** gesture is the natural language of deaf children (this point was considerably expanded by the authors who concluded their discussion of the deaf child with the quotation above); **(3)** the learning of speech and language by deaf children does and must begin at school age; **(4)** speech is an art; **(5)** the aim of education is happiness; and **(6)** there are two worlds—social behavioral, communicative and vocational—the one for hearing persons, the other for deaf persons. Most of these assumptions would need material qualifications to be acceptable in light of present knowledge and experience. Some of these qualifications have already been discussed.

With the exception of the child who is profoundly impaired in hearing as well as limited in mental potential, there is little reason to refer to speech as a "second language," superimposed on a "basic language" of sign and gesture to the detriment of the child. If the impairment is diagnosed early and clinical and guided parental work is begun by the

age of 2 or 3, the language of signs need not develop as "basic" and speech as "secondary." The idea that sign language or manual language is the "natural" language of the child with a profound hearing impairment, can be maintained only in spite of—not because of—known facts of infant and childhood behavior, the neurophysiology of the association centers in the brain, and the use of compensatory adjuncts to the impaired hearing mechanism in early linguistic and behavioral training. This has been demonstrated by the accomplishments of many children in a variety of special schools.

Moreover, in many schools, rated as oral, and offering auditory training and speech training, methods of instruction are carried out which necessarily fall short of helping to realize the potential of many children. Speech training may be carried through only the first 2 or 3 years, despite the fact that it takes the average child with normal hearing 7 to 8 years to master the form and structure of his native language. Auditory training is often an exercise in listening with headphones through an amplifier for three ½-hour periods per week, in spite of the fact that the average child with normal hearing receives sound-stimuli through every waking hour, and needs it to develop the imitative patterns of speech and language. In some schools for the deaf, the use of amplification is positively forbidden. The teaching of language often becomes a routine performance suggesting the activities of trained pups in vaudeville; the teacher drills a class in the recognition and verbalization of a set of objects, or of colors, or of numbers, or of parts of speech—in spite of the fact that the basic linguistic stimulus for the child with normal hearing is the constant interrelation between language and ideas, actions and reactions, which are part of the child's environment and experience.

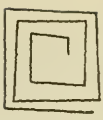
These are some of the reasons, apparently, for the diversification of views and attitudes that are currently expressed. It is to be hoped that the future will bring some changes in the picture that is evident in too many places. Special institutional education will always be necessary for many children with severely impaired hearing, but its objectives and methods should not necessarily be static; they should be set as high as science and technology and pedagogy can maintain them.

The "hard of hearing" child

Where does the difference lie between the deaf child and the hard of hearing child? Certainly not solely in terms of difference in auditory function. A host of other facts about the child are pertinent: **(1)** age of onset of impairment; **(2)** type of impairment; **(3)** treatment of the hearing mechanism; **(4)** nature of the impairment; **(5)** home environment; **(6)** parental insight; **(7)** physical development; **(8)** behavioral development;

and several others. Every one of these items in the child's history would seriously affect everything about him in terms of language, general development, behavior, and social maturity. Often, the relations between physical and psychologic conditions are asymmetrical; many children with a quite moderate hearing loss are severely handicapped in speech and behavior; others, with a severe impairment, can do amazingly well in communicative and behavioral adjustments.

A concomitant of the need for and usefulness of early audiologic diagnostic and clinical work is that many children can learn to get along in a more normal situation than is possible in a special institution. When and how best this can be achieved is a matter that should be determined by thorough study of the child's status, potential, and needs; it cannot be determined automatically by measuring the hearing loss and setting up an arbitrary line of division. Moreover, even the best of early audiologic work is not enough to carry a child through the constantly changing demands of childhood and youth in a complex society. Even the child with moderately impaired hearing may need a great deal of special education, as an adjunct to the regular school curriculum, sometimes as an alternative to certain aspects of the regular curriculum. Too frequently, children who are commonly classed as hard of hearing are supplied with hearing aids—on the assumption that this constitutes audiologic therapy—and literally cast upon the waters of the regular school environment, in full competition with normal-hearing children, without any further help in school or at home. Quite often, after floundering for a while, they turn up at schools for the deaf where they are redeemed among their fellows. Thereafter, the critical comment is that they should have been in the special school in the first place. This does not necessarily follow. More pertinent, perhaps, would be an awakening of school boards and superintendents to the need for special teachers for auditory training, speech reading, and speech training. These are the normal communicative adjuncts for children with impaired hearing. Much of the confusion, frustration, and failure that exists among the children with mild-to-severe impairments comes from failure to provide special education in a learning situation that is as normal as possible. Good audiologic services can start the child on his way, but he should be released from the special center as soon as the basic clinical job is done. That he needs help from adequately trained teachers whose business it is to teach the adjunctive skills that will help to compensate for the child's communicative needs, seems obvious. As yet, relatively few communities have recognized the nature and extent of these needs, and there is a nation-wide dearth of teachers trained to help children with impaired hearing.



SUMMARY

From the audiologic perspective expressed here, a full program for handling the needs of children with impaired hearing involves several quite definite steps and the interrelated services of many persons trained in various kinds of special work. These steps need to be organized so that there is close interplay under medical direction in case-finding and in both medical and nonmedical aspects of case-handling, and genuine insight on the part of everybody in contact with these children. Ideally, there should be smooth continuity and transition, in terms of all preventive and conservational measures, among maternal and child care, school health, crippled children's and vocational services. What part of this may be public and what part private, and what specific agencies are concerned, are matters for the community's determination. Moreover, a great deal of research, at basic and applied levels, needs to be carried on. The topics of such research are almost infinite, for they have to do with all aspects of behavior and development, of etiology, of medical treatment, diagnostic techniques, clinical methodology, and educational and vocational principles and practices—in short, with the entire array of knowledge relative to hearing, hearing impairment, and preventive and remedial work.

At least seven steps, or categories, seem implicit in such an approach to the problems of impaired hearing in children; only the first four or five steps will be pertinent for the great majority of children so impaired; the last two will obtain for those who are handicapped in any moderate or severe degree.

1. Public education, regarding both hearing and hearing impairment. Not only the child's parents, but his neighbors, need to be informed and aware of what hearing is and does, and what impaired hearing means.

2. Adequate case-finding. This should include all possible sources of referral from all agencies concerned with children. Good screening techniques have been developed for testing large populations of children. Less accurate means are being employed for case-finding among younger children in nursery schools, well-baby clinics, and hospitals. Too often, perhaps, screening for case-finding is confused with education regarding

the problems of impaired hearing. Consequently, in many sections of the country, case-finding has outrun the facilities for diagnosis and treatment. The facts of incidence and the knowledge of what to do about the problems are readily enough available so that it should no longer be necessary to demonstrate in a given community how serious and extensive these problems are. Case-finding without diagnosis and treatment is a costly and dubious undertaking.

3. Thorough diagnostic examination. This should be undertaken by interested and well-trained otologists and audiologists, preferably as a concomitant of complete pediatric appraisal. There are many causes for hearing impairment in children, and some are related to other than specifically otologic concerns. Most persons working with children are devoted to the doctrine of treating the child as a whole; it is a sound doctrine that should be followed. As indicated, thorough diagnostic examination may involve the best thinking of a wide range of medical specialties, each concerned with some aspect of the psycho-physical system. The pediatrician is apt to see the child first, know him best, and be in the best position to guide the analysis of his needs. This is perhaps more important for the preschool-age child whose physical condition or developmental behavior is deviant.

4. Medical and surgical treatment as indicated. Much of hearing impairment may be reversible or lessened, when it is observed and treated early enough. The modern use of antibiotics and radium therapy, to mention only two possibilities, gives ample evidence of success in reducing or reversing impairments, with a minimum of medical care, to an extent that was unheard of 20 years ago. It would seem almost incredible that any child with a serious impairment should be handled in special education prior to, or without, medical treatment that is clearly indicated. Unfortunately, there is considerable evidence that this occurs commonly.

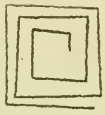
5. Audiologic study and consultation. Typically, this may involve long-term guidance of parents and child. For every 30 minutes spent with the child, the audiologic clinician is apt to spend an hour with the parents. Initial services involve the accurate measurement of auditory function, and judgment as to the extent and nature of the communicative disorder. This is a form of developmental diagnosis, for it involves behavior, language development, speech development, social maturity, and intelligence. It involves, too, an acquaintance with the pertinent familial relationships and explanation and guidance with the parents. When the use of amplification is indicated, an evaluation must be made of the kind best adapted to the child's needs, and training

begun in speech reading, speech, language, and auditory interpretation. Multiple referrals may be made through appropriate individuals or institutions in the community. Clinical audiology includes the appraisal of the child's needs, the institution of whatever clinical work is indicated, clear interpretation of the state of affairs to the parents, and consultation with them regarding the steps necessary for the child's best adjustment.

6. Appropriate special education. The direction that this should take is an entirely individual matter. In many instances, this step is obviated by adequate diagnosis, medical treatment, and follow-up care. When special educative steps are indicated, their detail is determinable by full acquaintance with the details of the problem. There may be a range from special seating in a classroom to training in a special institution. Sometimes a problem of special education is settled more or less automatically by the presence or absence of adequate facilities in a given community, or within a family's financial means. By and large, it is safe to suggest that there is a great need for speech and hearing therapists and special teachers, at school and preschool levels, throughout the nation. There is need, too, for far more knowledge among regular classroom teachers of the effects and implications of impaired hearing, and of ways to handle and help a child who is handicapped. When parents and teachers better understand the problems of this child, there will be far less frustration and distraction and repeating of grades and lack of achievement.

7. Vocational rehabilitation and training. Usually, this involves only the children with severe or profound impairment, or those with behavior so deviant that they are vocational problems on a variety of counts. Most departments of vocational rehabilitation are limited by statute to the age of 16 before they may begin to exert a direct influince in guidance, consultation, and training. In general, the work in vocational rehabilitation that has been developed in the past 20 years is one of the humanitarian highlights of our society, and pays for itself many times over in redeemed man-hours and productive self-support. There is reason to believe that with increasing emphasis on finding and working with the problems of impaired hearing at an early age, and with concomitant improvement in educability and educative achievement, the scope of vocational work with handicapped young people will be greatly enhanced in the future.

These problems of children with impaired hearing require the best professional thinking and services that are available, services founded on a philosophy of prevention and committed to a truly cooperative effort.



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CHILDREN with IMPAIRED HEARIN